CLAIMS

1. A mixture for making a moldable intumescent elastomeric thermoplastic material, comprising based on one hundred parts of said mixture:

about 40 to about 60 parts of chlorinated polyethylene;

up to about 15 parts of high-density polyethylene;

about 5 to about 10 parts of a plasticizer;

about 10 to about 20 parts of a water emitting substance selected from the group consisting of hydrated magnesium oxide, magnesium hydroxide and mixtures thereof;

up to about 10 parts of at least one gas generating compound selected from the group consisting of ammonium dihydrogen phosphate, ammonium polyphosphate and mixtures thereof;

about 3 to about 10 parts of a char former selected from the group consisting of polyhydric alcohols, carbohydrates, starch and mixtures thereof;

about 1 to about 7 parts of antimony oxide;

about 2 to about 12 parts of a filler material selected from the group consisting of graphite, water intercalated graphite, mica, titanium dioxide and mixtures thereof; and

about 0.25 to about 2 parts of a stabilizer selected from the group consisting of thio based antioxidants, hindered phenol antioxidants and mixtures thereof.

2. The mixture of claim 1 wherein:

said chlorinated polyethylene is present at about 55 parts;

said plasticizer is present at about 7 parts;

said ammonium dihydrogen phosphate is present at about 8 parts;

said hydrated magnesium oxide is present at about 15 parts;

said filler is graphite;

and said stabilizer is a mixture of distearylthiodipropionate and hindered phenol and is present at about 1 part.

3. The mixture of claim 1 wherein said high-density polyethylene is present at about 5 to about 10 parts.

4. The mixture of claim 3 wherein said chlorinated polyethylene is present at about 45 to about 50 parts.

5. The mixture of claim 4 wherein:
said plasticizer is present at about 7 parts;
said ammonium dihydrogen phosphate is present at about 8 parts;
said hydrated magnesium oxide is present at about 15 parts;
said antimony oxide is present at about 5 parts; and
said char former is pentaerythritol and is present at about 5 parts.

6. The mixture of claim 4 wherein said filler is a graphite which contains intercalated water and is present at greater than about 10 parts.

7. The mixture of claim 6 wherein said mixture is free of an ammonia producing compound.

8. The mixture of claim 6 wherein said hydrated magnesium oxide, magnesium hydroxide, and mixtures thereof are present at a level of less than about 15 parts.

9. The mixture of claim 4 wherein said stabilizer contains equal parts of distearylthiodipropionate and hindered phenol.

10. The mixture of claim 1 wherein said mixture comprises:

about 50 parts of said chlorinated polyethylene;

about 5 parts of said high-density polyethylene;

about 7 parts of said plasticizer;

about 15 parts of said hydrated magnesium oxide;

about 0.5 parts of said distearylthiodipropionate;

about 0.5 parts of said hindered phenol;

about 5 parts of said antimony oxide;

about 5 parts of said pentaerythritol; and

about 12 parts of said water intercalated graphite.

11. A moldable intumescent thermoplastic composition, comprising based on one hundred parts of said composition:

about 40 to about 60 parts of chlorinated polyethylene;

up to about 15 parts of high-density polyethylene;

about 5 to about 10 parts of a plasticizer;

about 10 to about 20 parts of a water emitting substance selected from the group consisting of hydrated magnesium oxide, magnesium hydroxide and mixtures thereof;

up to about 10 parts of at least one gas generating compound selected from the group consisting of ammonium dihydrogen phosphate, ammonium polyphosphate and mixtures thereof;

about 3 to about 10 parts of a char former selected from the group consisting of polyhydric alcohols, carbohydrates, starch and mixtures thereof;

about 1 to about 7 parts of antimony oxide;

about 2 to about 12 parts of a filler material selected from the group consisting of graphite, mica, titanium dioxide and mixtures thereof;

about 0.25 to about 2 parts of a stabilizer selected from the group consisting of thio based antioxidants, hindered phenol antioxidants and mixtures thereof;

up to about 5 parts of a curing agent; and

up to about 3 parts of a co-curing agent or an accelerator.

12. The composition of claim 11 wherein:

said chlorinated polyethylene is present at about 55 parts;

said plasticizer is present at about 7 parts;

said ammonium dihydrogen phosphate is present at about 8 parts;

said hydrated magnesium oxide is present at about 15 parts;

said filler is graphite;

and said stabilizer is a mixture of distearylthiodipropionate and hindered phenol and is present at about 1 part;

said curing agent is selected from the group consisting of a peroxide based curing system, sulfur based curing system, and combinations comprising at least one of the foregoing, and is present at about 0.001 to about 55 parts.; and

13. The composition of claim 11 wherein said high-density polyethylene is present at about 5 to about 10 parts.

14. The composition of claim 13 wherein said chlorinated polyethylene is present at about 45 to about 50 parts.

15. The composition of claim 14 wherein:

said plasticizer is present at about 7 parts;

said ammonium dihydrogen phosphate is present at about 8 parts;

said hydrated magnesium oxide is present at about 15 parts;

said antimony oxide is present at about 5 parts;

said char former is pentaerythritol and is present at about 5 parts;

said curing agent is selected from the group consisting of a peroxide based curing system, sulfur based curing system, and combinations comprising at least one of the foregoing, and is present at about 0.001 to about 5 parts.

16. The composition of claim 14 wherein said filler is a graphite which contains intercalated water and is present at greater than about 10 parts.

17. The composition of claim 16 wherein said composition is free of an ammonia producing compound.

18. The composition of claim 16 wherein said hydrated magnesium oxide and magnesium hydroxide or mixtures thereof is present at a level of less than about 15 parts.

19. The composition of claim 14 wherein said stabilizer contains equal parts of distearylthiodipropionate and hindered phenol.

20. The composition of claim 11 wherein said composition comprises:
about 50 parts of said chlorinated polyethylene;
about 5 parts of said high-density polyethylene;
about 7 parts of said plasticizer;
about 15 parts of said hydrated magnesium oxide;
about 0.5 parts of said distearylthiodipropionate;
about 0.5 parts of said hindered phenol;
about 5 parts of said antimony oxide;
about 5 parts of said pentaerythritol;
about 12 parts of said water intercalated graphite;

about 0.001 to about 5 parts of said curing agent, said curing agent is selected from the group consisting of a peroxide based curing system, sulfur based curing system, and combinations comprising at least one of the foregoing.

21. The composition of claim 11, wherein said composition has a tension set of about zero after being stretched to 100% elongation when measured on a sample of 50 millimeters by 6.25 millimeters by 2 millimeters according to ASTM D412.

22. An intumescent elastomeric thermoplastic composition, comprising based on one hundred parts of said composition:

about 55 parts of chlorinated polyethylene;

up to about 15 parts of high-density polyethylene;

about 7 parts of a plasticizer;

about 15 parts of a water emitting substance selected from the group consisting of hydrated magnesium oxide, magnesium hydroxide and mixtures thereof;

about 8 parts of at least one gas generating compound selected from the group consisting of ammonium dihydrogen phosphate, ammonium polyphosphate and mixtures thereof;

about 3 to about 10 parts of a char former selected from the group consisting of polyhydric alcohols, carbohydrates, starch and mixtures thereof;

about 1 to about 7 parts of antimony oxide;

about 2 to about 12 parts of a filler material selected from the group consisting of graphite, graphite having intercalated water, mica, titanium dioxide and mixtures thereof;

about 0.25 to about 5 parts of a stabilizer comprising a mixture of distearylthiodipropionate and hindered phenol in equal parts;

about 0.001 to about 5 parts of a curing agent; and

up to about 3 parts of a co-curing agent or an accelerator.

23. A molded article, comprising based on one hundred parts of said article:

about 40 to about 60 parts of chlorinated polyethylene;

up to about 5 parts of a curing agent;

up to about 3 parts of a co-curing agent or an accelerator;

up to about 15 parts of high-density polyethylene;

about 5 to about 10 parts of a plasticizer;

about 10 to about 20 parts of a water emitting substance selected from the group consisting of hydrated magnesium oxide, magnesium hydroxide and mixtures thereof;

up to about 10 parts of at least one gas generating compound selected from the group consisting of ammonium dihydrogen phosphate, ammonium polyphosphate and mixtures thereof;

about 3 to about 10 parts of a char former selected from the group consisting of polyhydric alcohols, carbohydrates, starch and mixtures thereof;

about 1 to about 7 parts of antimony oxide;

about 2 to about 12 parts of a filler material selected from the group consisting of graphite, mica, titanium dioxide and mixtures thereof; and

about 0.25 to about 2 parts of a stabilizer selected from the group consisting of thio based antioxidants, hindered phenol antioxidants and mixtures thereof.

24. The molded article of claim 23 wherein said curing agent is selected from the group consisting of peroxide based curing system, sulfur based curing system, and combinations comprising at least one of the foregoing, and is present at about 0.05 to about 5 parts.

25. The molded article of claim 23 wherein said curing agent and said co-curing agent are present in equal amounts.

26. The molded article of claim 23 wherein:

said chlorinated polyethylene is present at about 55 parts;

said plasticizer is present at about 7 parts;

said ammonium dihydrogen phosphate is present at about 8 parts;

said hydrated magnesium oxide is present at about 15 parts;

said filler is graphite;

said stabilizer is a mixture of distearylthiodipropionate and hindered phenol and is present at about 1 part;

said curing agent is present at about 0.005 to about 5 parts.

27. The molded article of claim 23 wherein said high-density polyethylene is present at about 5 to about 10 parts.

28. The molded article of claim 27 wherein said chlorinated polyethylene is present at about 45 to about 50 parts.

29. The molded article of claim 28 wherein:

said plasticizer is present at about 7 parts;

said ammonium dihydrogen phosphate is present at about 8 parts;

said hydrated magnesium oxide is present at about 15 parts;

said antimony oxide is present at about 5 parts; and

said char former is pentaerythritol and is present at about 5 parts.

30. The molded article of claim 29 wherein said hydrated magnesium oxide, magnesium hydroxide, and mixtures thereof is present at a level of less than about 15 parts.

31. The molded article of claim 28 wherein said stabilizer contains equal parts of distearylthiodipropionate and hindered phenol.

32. The molded article of claim 23 wherein said filler is a graphite which contains intercalated water and is present at greater than about 10 parts.

33. The molded article of claim 23 wherein said molded article is free of an ammonia producing compound.

34. The molded article of claim 23 wherein said mixture comprises:
about 50 parts of said chlorinated polyethylene;
about 5 parts of said high-density polyethylene;
about 7 parts of said plasticizer;
about 15 parts of said hydrated magnesium oxide;
about 0.5 parts of said distearylthiodipropionate;
about 0.5 parts of said hindered phenol;
about 5 parts of said antimony oxide;
about 5 parts of said pentaerythritol; and
about 12 parts of said water intercalated graphite.

35. The molded article of claim 23 wherein said molded article is selected from the group consisting of a ceiling tile, floor tile, wall tile, gasket, dashboard, tubing, floor covering, kick panel, bulkhead, interior trim, and combinations comprising at least one of the foregoing.

36. A composite material, comprising:

a reinforcing material selected from the group consisting of steel, plastic, wood, carbon, and combinations comprising at least one of the foregoing;

an intumescent polymer binder comprising based on one hundred parts of said binder:

about 60 parts chlorinated polyethylene;

up to about 5 parts of a curing agent;

up to about 3 parts of a co-curing agent or an accelerator;

up to about 15 parts high-density polyethylene;

about 7 parts plasticizer;

about 15 parts hydrated magnesium oxide;

about 0.5 parts distearylthiodipropionate;

about 0.5 parts hindered phenol;

about 5 parts antimony oxide;

about 5 parts pentaerythritol; and

about 4 to about 12 parts graphite.

37. The composite material of claim 37 further comprising up to about 10 parts of at least one gas generating compound selected from the group consisting of ammonium dihydrogen phosphate, ammonium polyphosphate and mixtures thereof.

38. The composite material of claim 36 wherein said graphite is a graphite which contains intercalated water.

39. The composite material of claim 36 wherein said composite material is free of an ammonia producing compound.

40. A coated article, comprising:

a substrate having an intumescent polymer applied thereupon, wherein said intumescent polymer comprises based on one hundred parts of said polymer:

about 60 parts of chlorinated polyethylene;

up to about 15 parts of high-density polyethylene;

about 5 to about 10 parts plasticizer;

about 15 parts of a water emitting substance selected from the group consisting of hydrated magnesium oxide, magnesium hydroxide and mixtures thereof;

up to about 10 parts of at least one gas generating compound selected from the group consisting of ammonium dihydrogen phosphate, ammonium polyphosphate and mixtures thereof;

about 3 to about 10 parts of a char former selected from the group consisting of polyhydric alcohols, carbohydrates, starch and mixtures thereof;

about 2 to about 5 parts of antimony oxide;

about 2 to about 12 parts of a filler material selected from the group consisting of graphite, graphite containing intercalated water, mica, titanium dioxide and mixtures thereof; and

about 0.25 to about 2 parts of a stabilizer selected from the group consisting of thio based antioxidants, hindered phenol antioxidants and mixtures thereof.

41. The coated article of claim 40 further comprising a primer disposed on said substrate, and between said substrate and said intumescent polymer.

42. The coated article of claim 40 further comprising an adhesive disposed on said substrate, and between said substrate and said intumescent polymer.

43. The coated article of claim 40 wherein said filler material is graphite which contains intercalated water.

44. The coated article of claim 40 wherein the coated article is flexible.

45. A method for forming a moldable intumescent elastomeric thermoplastic composition, comprising based on one hundred parts of said composition:

combining under shear at a temperature and for a time sufficient in order to form said composition about 60 parts of chlorinated polyethylene,

up to about 15 parts of high-density polyethylene,

about 5 to about 10 parts plasticizer,

about 10 to about 20 parts of a water emitting substance selected from the group consisting of hydrated magnesium oxide, magnesium hydroxide and mixtures thereof,

about 3 to about 10 parts of a char former selected from the group consisting of polyhydric alcohols, carbohydrates, starch and mixtures thereof,

about 1 to about 7 parts of antimony oxide,

about 0.25 to about 2 parts of a stabilizer selected from the group consisting of thio based antioxidants, hindered phenol antioxidants and mixtures thereof,

up to about 10 parts of at least one gas generating compound selected from the group consisting of ammonium dihydrogen phosphate, ammonium polyphosphate and mixtures thereof,

about 2 to about 12 parts of a filler material selected from the group consisting of graphite, mica, titanium dioxide and mixtures thereof,

up to about 5 parts of a curing agent, and

up to about 3 parts of a co-curing agent or an acclerator.

46. The method of claim 45 wherein combining under shear comprises combining under a first shear for about 1 to about 10 minutes and at about 100 to about 200°C.

47. The method of claim 45 wherein combining under shear comprises combining under a second shear for about 1 to about 10 minutes and at about 75 to about 200°C.

48. A moldable intumescent elastomeric thermoplastic composition formed according to the method of claim 45, wherein said composition has a tension set of about zero after being stretched to 100% elongation when measured on a sample measuring 50 millimeters by 6.25 millimeters by 2 millimeters according to ASTM D412.

49. A molded article comprising the intumescent elastomeric composition of claim 48, wherein the molded article is flexible.

50. A method for forming a molded article composed in part of an intumescent elastomeric composition, comprising:

introducing an elastomeric intumescent thermoplastic composition into a mold, wherein said elastomeric intumescent thermoplastic composition comprises based on one hundred parts of said composition:

about 40 to about 60 parts of chlorinated polyethylene;

up to about 5 parts of a curing agent;

up to about 3 parts of a co-curing agent or an accelerator;

up to about 15 parts of high-density polyethylene;

about 5 to about 10 parts plasticizer;

about 10 to about 20 parts of a water emitting substance selected from the group consisting of hydrated magnesium oxide, magnesium hydroxide and mixtures thereof;

up to about 10 parts of at least one gas generating compound selected from the group consisting of ammonium dihydrogen phosphate, ammonium polyphosphate and mixtures thereof;

about 3 to about 10 parts of char former selected from the group consisting of polyhydric alcohols, carbohydrates, starch and mixtures thereof;

about 1 to about 7 parts of antimony oxide;

about 2 to about 12 parts of a filler material selected from the group consisting of graphite, mica, titanium dioxide and mixtures thereof; and

about 0.25 to about 2 parts of a stabilizer selected from the group consisting of thio based antioxidants and hindered phenol antioxidants and mixtures thereof; and

forming said molded article.

51. The method of claim 50 wherein forming is selected from the group consisting of extrusion, injection molding, compression molding, and vacuum forming.

52. A method for forming a coated article, comprising:

disposing an intumescent elastomeric thermoplastic composition onto an article; and

forming a coating on said article;

wherein said intumescent elastomeric composition comprises based on one hundred parts of said composition:

about 40 to about 60 parts of chlorinated polyethylene;

up to about 5 parts of a curing agent;

up to about 3 parts of a co-curing agent or an accelerator;

up to about 15 parts of high-density polyethylene;

about 5 to about 10 parts plasticizer;

about 10 to about 20 parts of a water emitting substance selected from the group consisting of hydrated magnesium oxide, magnesium hydroxide and mixtures thereof;

up to about 10 parts of at least one gas generating compound selected from the group consisting of ammonium dihydrogen phosphate, ammonium polyphosphate and mixtures thereof;

about 3 to about 10 parts of a char former selected from the group consisting of polyhydric alcohols, carbohydrates, starch and mixtures thereof;

about 1 to about 7 parts of antimony oxide;

about 2 to about 12 parts of a filler material selected from the group consisting of graphite, mica, titanium dioxide and mixtures thereof; and

about 0.25 to about 2 parts of a stabilizer selected from the group consisting of thio based antioxidants, hindered phenol antioxidants and mixtures thereof.

53. The method of claim 52 wherein said forming is selected from the group consisting of heating, extruding, curing and combinations comprising at least one of the foregoing methods.

54. The method of claim 52 wherein said disposing is selected from the group consisting of laminating, hot plate welding, and combinations comprising at least one of the foregoing methods.

55. The method of claim 52 further comprising disposing an adhesive on said article prior to disposing said intumescent elastomeric composition.

56. The method of claim 52 further comprising disposing a primer on said article prior to disposing said intumescent elastomeric thermoplastic composition.

57. The method of claim 52 wherein said disposing comprises disposing a solution or a suspension of the intumescent elastomeric composition and a solvent onto an article.

58. The method of claim 57 wherein said disposing is selected from the group consisting of dipping, spraying, thermal drying, chemical dessication, physical dessication, and combinations comprising at least one of the foregoing.